UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

FEBRUARY 1949

EROSION CONTROL PRACTICES DIVISION

Hairy Vetch and Austrian Winter Peas Seeded October and Later Did Not Provide Winter Ground Cover - C. J. Whitfield, Amarillo, Texas.- "In the fall of 1948, several legume plantings were made on sorghum stubble land for the purpose of testing their value for a cover crop in this territory for wind erosion control. Sorghum stubble, in 40-inch rows, during short crop years usually leaves the land in a condition to blow during the winter and spring season when there is no growing crop on the land.

"Plantings of Hairy vetch and Austrian winter peas were made in October and November of 1948, on 40-inch row sudan grass and Kafir x Sumac stubble. The October plantings came up to a fair stand. A better stand was secured on the Austrian winter peas than on the vetch planting. The November plantings have not yet emerged. The plants that have emerged have made very little growth during the winter and are not, at the present time, furnishing any protective cover."

Summary of Possible Advantages From Use of Chemicals to Control Weeds on Fallow - Torlief Aasheim, Havre, Montana.-"The use of chemicals on fallow for weed control during the fallow season has several points in its favor if it can be done effectively and economically without reducing crop yields. Some of the advantages are:

1. With fewer tillage operations there should be less soil pulverization and more residue left on the surface, which is desirable from the standpoint of erosion control.

2. By reducing the number of tillage operations more stubble should be left standing to help hold snow on fallow over winter.

3. During years when it seems desirable to kill weeds in the stubble after harvest, spraying this stubble will result in less stubble being knocked down than if it were cultivated.

4. Spraying can be done when it is too wet or too dry to cultivate effectively.

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

5. Spraying is faster than cultivating, which could result in more timely weed control.

Grazing Trials - B. H. Hendrickson, Watkinsville, Ga.-"The Station is located in Oconee County, which is a fairly typical Southern Piedmont county. If the best available census figures are correct, about 25 percent of the farmland is open land, but not in any productive use. This is practically all hilly eroded land formerly used for cotton and corn production.

"Starting 7 or 8 years ago on similar land, the Station began to develop a herd of Angus cattle, starting with a few common cows, and to develop pastures as the herd increased. Three registered Angus bulls in succession have headed the herd, which is now practically pure bred.

"During the 1945-48 period, the herd has averaged 20 to 25 cow units. Grazing records have been kept during this period.

"We now have 12 trial pastures. Necessarily, some of these were in experimental stages during this period, as pioneering work in this direction had to be done first.

"Records kept were in the form of numbers of cow units per acre of grazing supplied by the different pastures. Cattle were kept in good condition at all times. Some cow-lot feeding of hay, or hay and crushed grains were fed, as needed. Grazing at such periods was estimated at 50 percent, or only 25 percent adequate, respectively.

"In summarizing the grazing estimates in order to rate the different pastures, only those which had been reasonably well fertilized, not overgrazed, and which supported the largest number of cow units were considered. The most productive grazing crops or crop combinations in these grazing trials, to date, are listed by special 'grazing seasons' in the following table.

		Acres needed per cow unit for adequate grazing
Winter (Nov.-Feb. = 4 months)	Oats, Crimson clover and ryegrass	1.7
Spring (Mar.-April = 2 months)	Alfalfa	1.2
	Oats, crimson clover and ryegrass (closed April 15 to reseed)	1.8
	Bottomland Bermuda & Dallis grass and white clover	2.0
Summer (May-Sept. = 5 months)	Alfalfa (Closed Sept. 30th, to retain plant vigor)	1.0
	Bottomland Bermuda & Dallis grasses and white clover	1.2
	Sericea-Kentucky No. 31 Fescue combination	1.3
October = 1 month	Kudzu	1.4

"All of the grazing crops listed in the table excepting alfalfa provided more or less grazing at other seasons of the year as well. Others not listed provided fairly good grazing during one or more seasons. These include Oats, Manganese bur clover, vetch and Caley peas, button clover, Kobe lespedeza, tall fescue, and orchard grass.

"Our experience indicates that about 2 acres of eroded upland pastures per cow unit should be provided in order to obtain good long-season grazing and variety of grazing crops for beef cattle.

"A minimum of 3 or 4 separate pastures on a typical Southern Piedmont farm of 200 acres or more is indicated as a reasonably good set-up for maintaining a small beef cattle breeding herd. One of the principal source areas producing flash runoff, and excessive erosion losses in the Southern Piedmont may be efficiently controlled, and the land well utilized in this manner."

Pasture Management in Relation to Finishing Steers for Market - J. R. Johnston, Temple, Texas.-"Sixteen finished steers were sold to Amour Packing Company at Ft. Worth on February 22nd. These cattle yielded 59.2 percent as chilled beef. Fourteen of these cattle graded U. S. Choice and two graded High Good. These steers were the tail-end of our 1948 grazing steers. Thirty-one steers used to graze oats, sweetclover, and sudan grass during 1948 were sold in finish on December 7, 1948. The steers sold this month were grazed on Bermuda-buffalo grass pasture in 1948. These data are interesting in that they show dry-lot finishing of fat cattle can be quickly accomplished if the steers are kept gaining nicely on good forage during the summer months, rather than letting them drag on poor permanent pasture.

"The Station had 125 visitors during February. Ten man days were spent in consultation with farmers and agricultural workers and in speaking to farm groups..

Availability of Moisture - Important Phase of Pasture Irrigation Study - C. A. Van Doren, Dixon Springs, Illinois.-"L. E. Gard, Soil Conservation Service, and George McKibben, Ill. Ag. Expt. Sta. have assembled data indicating trends in moisture utilization on an irrigated pasture. Two adjacent five acre tracts were treated and seeded in the fall of 1947 and spring of 1948 to a ladino clover-grass mixture. One 5-acre tract received no supplemental irrigation. One-half of the second 5-acre tract received six 1-inch irrigations, and the other half, six 2-inch irrigations during July, August, and September, in 1948.

"Electrical resistance blocks were installed to determine when to irrigate and also to determine the effectiveness of use of supplemental water in increasing forage production. Blocks were installed at four depths in the upper 12 inches at four locations on each plot. The percentage of the available moisture remaining in the soil before and after two of the six irrigations is shown in the following table.

Percent of Available Moisture Remaining in the Soil Before and After Two Selected Irrigations - 1948 (1)

	Before 7/31	After 8/6	Before 8/17	After 8/23	Seasonal Average
Non-Irrigated	10	4	0	0	17
Irrigated (6 times, 1" applications)	6	32	36	52	34
Irrigated (6 times, 2" applications)	28	49	50	59	48

(1) Tentative calibrations indicate this soil would contain 29% moisture (on dry weight basis) at saturation and 11% at permanent wilting. Thus 29-11 leaves 18% available to plants in saturated soil. Figures in table represent percentage of this available moisture in soil on dates indicated.

"A marked increase in the amount of moisture available to forage in the surface 12 inches after irrigation is indicated for both one and two inch applications. During the month of August only slight amounts of available moisture were present in the surface 12 inches of soil on the non-irrigated field. For a three months period the soil where six 1-inch irrigations were applied contained 34 percent of the available moisture, and the soil receiving six 2-inch irrigations contained 48 percent of the total possible available moisture. It is apparent that for maximum growth with good treatment on these soils even, with normal rainfall during July, August, and September, an additional supply of water is needed. The application of six 1-inch irrigations did not give maximum growth, even though it made an average of over five inches of water per month. When the total water was increased to average seven inches per month by applying six 2-inch irrigations, an additional 2251 pounds of dry matter resulted.

"Forage yields were increased as follows by irrigation on the plot receiving lime, phosphate, and potash:

Six inches applied in 1" applications increased yields 1415 pounds over non-irrigated

Twelve inches applied in 2" applications increased yields 3666 pounds over non-irrigated

Twelve inches applied in 2" applications increased yields 2251 pounds over six inches in 1" applications.

"Animal gains during the season were increased from 84 pounds per acre on the non-irrigated to 140 pounds per acre on the irrigated field. Yields were low as the new seeding was not well established."

Nitrogen Release from Soil Conserving Legumes and Grasses - Hugh C. McKay, St. Anthony, Idaho.-"The soil conserving legume and grass rotations vary in their effect upon the nitrogen in the soil. The amount of nitrogen is important in that the yields of wheat obtained and the protein content of the wheat is effected by it. The pounds of nitrogen produced from the various rotations are given in the following table:

Pounds of nitrogen produced per acre during the summer fallow season, following various legume grass rotations 1949.

Rotation	1st fallow after legume and/or grass	2nd fallow after legume and/or grass	3rd fallow after legume and/or grass	Total
Alfalfa	374	211	182	767
Alfalfa & Grass	298	184	213	695
Sweet clover	267	357	163	787
Sweet clover & Grass	193	316	170	679
Grass	212	124	120	456

"The rotation producing the highest amount of nitrogen per acre is the straight sweet clover with the alfalfa rotation next. The grass rotation produced the least amount of nitrogen, this was expected because grass is a heavy user of nitrogen.

"The variations between the fallow years are interesting. For the alfalfa and alfalfa and grass rotations the highest amount of nitrogen is produced in the first fallow year. While in the sweet clover and sweet clover and grass rotations the highest amount is produced in the second fallow year. This is probably due to the fact the alfalfa and the alfalfa and grass are fall plowed which results in a good fallow, the sweet clover and sweet clover and grass are plowed in the spring and there is not too much moisture left in the first fallow year for decomposition. Consequently the greatest effect is found in the second fallow year, this has been reflected in the yields obtained.

"The alfalfa and sweet clover plots with grass in them have less nitrogen produced the first two fallows, but in the third fallow year they are higher than the straight legume."

Soil Conservation Practices in Peach Orchards - John T. Bregger, Clemson, S. C.-"Tree measurements were made in all orchard plots. Data was then summarized and compared with previous year (See Table 1). Possibly as a result of light fruit yields (some trees without fruit), there appeared to be no significant differences between treatments in their 1948 growth increment. Moreover, it is apparent that the peach trees under treatments which curtailed their growth when they were younger are now making normal growth in comparison with the more favorable treatments. This is particularly true of the Lespedeza sericea plots where no cultivation has been practiced in eight years. There is also a 'catching up' tendency in the 'minimum cultivation' treatments with vetch and rye cover crops.

Table 1.--Effects of soil conservation practices on peach tree growth.

Soil Management Practice	1948 trunk cir. in inches	1949 trunk cir. in inches	Percent increase over 1948
Clean cultivation (check)	20.2	21.9	8.4
Grain straw mulch	22.55	24.5	8.6
Sorghum pomace mulch	19.25	20.65	7.3
Lespedeza sericea, perennial cover	17.15	18.65	8.7
Kobe lespedeza, continuous cover	17.4	18.8	8.0
Soybean-Sudan grass, summer c.c., winter mulch	18.5	20.0	8.1
Vetch (winter c.c.); soybeans (summer c.c.)	21.85	23.8	8.9
Vetch " " ; crabgrass " "	21.6	23.5	9.0
Rye " " ; soybeans " "	18.95	20.5	8.2
Rye " " ; crabgrass " "	18.4	20.1	9.2
Vetch plots; minimum spring cultivation*	21.4	23.5	9.8
Vetch plots; 1-1/2 months cultivation in early summer	21.95	23.8	8.4
Vetch plots; 3 months cultivation in early summer	21.8	23.7	8.7
Rye plots; minimum spring cultivation*	18.7	20.7	10.7
Rye plots; 1-1/2 months cultivation in early summer	19.3	20.8	7.8
Rye plots; 3 months cultivation in early summer	18.0	19.5	8.3
Vetch plots; cover crop residues left on surface	22.15	23.9	7.9
Vetch plots; cover crop residues turned under	21.3	23.4	9.9
Rye plots; cover crop residues left on surface	19.6	21.2	8.2
Rye plots; cover crop residues turned under	17.7	19.4	9.6
Soybean plots; cover crop residues left on surface	21.3	22.7	6.6
Soybean plots; cover crop residues turned under	19.5	21.6	10.8
Crabgrass plots; cover crop residues left on surface	20.45	22.4	9.5
Crabgrass plots; cover crop residues turned under	19.5	21.3	9.2

* Seedbed preparation only (for summer cover crop).
Orchard planted 1939. Pretreatment one year -- summer cover crop of soybeans. Four trees to plot, all individual treatments replicated in duplicate plots. Nitrogen applications on all plots identical except sorghum pomace mulch. P and K fertilizer added to all cover crops; pH maintained above 5.5.

"Cover crop stands were evaluated throughout the Experimental Orchard. In view of the extremely rainy weather during November and December, fall sown crops of vetch and rye did not make as favorable a growth as normally. Under the close space of terraces, the soil remained wetter than under open field conditions and this may have been the main reason for the poor growth of the deeper rooted species. In the case of crimson clover and Southern spotted bur clover where much of seed was at or near the soil surface, much better growth was taking place. This was particularly true of the Southern spotted bur clover where the height of growth was far greater than in the case of crimson clover. The latter species apparently does not do more than 'stool out' until day length and temperature conditions are satisfactory for stem elongation.

Evaluation of Sprinkler Irrigation in Northwest - "A first hand study was made of sprinkler irrigation methods in Yakima Valley orchards (State of Washington). Over 300 growers are now practicing sprinkler irrigation in that state and find many advantages besides that of water conservation. While a more complete report of these observations and conferences will be given in the 1948 Annual Report, a few of the more pertinent findings are enumerated here:

1. Less erosion results from sprinkler irrigation in contrast to rill irrigation.

2. Sprinkler irrigation permits increased use of continuous cover cropping for soil improvement.

3. Sprinkler irrigation permits a fast method for applying fertilizer.

4. Sprinkler irrigation permits mowing or rolling down of cover crop which in turn decreases soil puddling, soil erosion and water evaporation.

5. Best peach growers use low rates of water application 1/3 inch per hour or less. Station Horticulturist Overley recommends 1/5 to 1/3 inch per hour, well under infiltration rate. To prevent puddling 'don't let water hit water', he says.

6. Increased rate of application can be made with mulch. A growing cover crop or a cover crop residue should be on the soil when sprinkler irrigation is made."

Tentative Specifications for Strip Cropping - D. D. Smith, Columbia, Missouri.-"As the result of a request by Operations for assistance in preparing strip crop specifications for use on the river hill soils in Central and Eastern Missouri, a review of length and degree of slope and strip cropping data was made.

"Total soil loss increased with slope length at a greater rate on the tighter soils (Shelby) than on the more open soils (Marshall and Fayette). On the Shelby soil runoff increased slightly with slope length, while on the Marshall it decreased exponentially with slope length, becoming at a length of 630 feet only 57 percent of that for 36.3-foot plot (USDA Tech. Bul. 959). On the Fayette at a length of 145.2 feet it was 88 percent of that at a 72.3-foot length. The exponents of length for the 3 soils were as follows:

Length (Ft)	Shelby	Fayette	Marshall
100 - 200	1.9	1.5	1.35
200 - 300	1.6	-	1.27
300 - 400	-	-	1.21
400 - 600	-	-	1.20

"These data indicate one of the reasons why strip cropping is adaptable to the more open soils and why terracing is a more adaptable and effective practice on the tighter soils such as the Shelby. There is the implication that wider terrace spacing could be used without an increase in soil loss on soils such as the Marshall and Fayette than on the Shelby. Since the river hill soils of Missouri are similar to the Fayette, strip cropping should be successfully adaptable to them. It will not, however, solve the gully and waterway problem which has been a drawback to the terracing program on these soils in Missouri.

"The following tentative specifications for strip cropping were developed:

Tentative Strip Cropping Specifications for River Hill Soils of Missouri.

No.	Rotation	Maximum strip width (feet) for slope of 8%	10%	12%	14%	16%	18%	20%
1	Fall grain-grass & legume mixture 7 years	200	200	200	200	200	160	120
2	Fall grain-grass & legume mixture 5 years	200	200	200	200	180	120	90
3	Fall grain-legume mix.,7 yrs.	200	200	200	200	140	90	62
4	Fall grain-grass & legume mixture 3 years	200	200	200	200	140	90	62
5	Fall grain-legume mix. 5 yrs.	200	200	200	180	110	76	
6	Fall grain-legume mix. 3 yrs.	200	200	200	120	76		
7	Fall grain-grass & legume mixture 1 yr. (Buffer)*	200	200	140	90			
8	Row crop-fall grain-grass & legume mixture 4 years	200	120	62				
9	Fall grain-legume mixture 1 yr. (Buffer)*	200	160	90				
10	Row crop-fall grain-grass & legume mixture 2 years	140	76					
11	Row crop-fall grain-grass & legume mixture 1 year	90						
12	Fall grain, lespedeza (Buffer)*	140	76					

* Buffer strips should be same width as cultivated strips to permit reversal of the strips for re-establishment of the grass.

For a W&L-W-M-M rotation use limitations for rotation No. 6

% Slope	Slope Length (Feet)		
	200	300	400
	Rotation Numbers	Rotation Numbers	Rotation Numbers
7-8	1 to 12	1 to 10 & 12	1 to 10 & 12
9-10	1 to 10 & 12	1 to 9	1 to 7 & 9
11-12	1 to 9	1 to 7 & 9	1 to 7
13-14	1 to 7	1 to 6	1 to 6
15-16	1 to 6	1 to 5	1 to 4
17-18	1 to 5	1 to 4	1 & 2
19-20	1 to 4	1 & 2	1

Contour Cultivation and Terraces in Relation to Wheat Yields - Harley A. Daniel, Guthrie, Oklahoma.-"The effect of contour cultivation and terraces on the yield of wheat has been studied at the Wheatland Station at Cherokee since 1942. The results are as follows:

Effect of Contour Cultivation and Terraces on Wheat Yields at Cherokee, Okla.1/

Year	Wheat Yields (Bushels per Acre)			Difference in Yield (Bu. per Ac.)		Precipitation 3/ Inches	
	With Slope	Contour	Terraced & Contoured 2/	Contour	Terraced & Contoured	Total Annual	Departure From Average
1942	16.0	15.5	14.1	-0.5	-1.9	30.0	+4.4
1943	9.2	9.9	8.0	0.7	-1.2	20.3	-5.6
1944	17.7	19.2	19.4	1.5	1.7	20.4	-5.5
1945	23.2	24.6	24.5	1.4	1.3	34.3	+8.6
1946	21.0	24.0	23.8	3.0	2.8	23.7	-2.1
1947	18.8	19.5	20.0	0.7	1.2	24.6	-1.2
1948	14.5	15.1	16.5	0.6	2.0	17.9	-7.8
Ave.	17.2	18.3	18.0	1.1	0.8	24.5	-1.5

1/ Data compiled from averages of stubble mulch, plowed, listed and basin listed plots.
2/ Short, level terraces, one end open.
3/ Based on Weather Bureau record in Cherokee, Oklahoma, Since 1915.

"The first and second years after the terraces were built the yield of wheat on the terraced and contour cultivated plots was less than on those cultivated with the slope. But, beginning with the third year the yields have been higher on the terraced and contour cultivated plots. With the exception of the first year contour cultivation alone has increased crop yields."

Percentage of Total Annual Soil Loss that is Associated with Rains Causing Half-Ton or More Soil Loss - George W. Hood, Batesville, Arkansas.-"It is generally considered that the greatest soil loss occurs from a few storms of high intensity and usually during the growing period. Our records for the past 10 years shows that excessive soil loss may occur every month of the year, and that it is necessary for the surface of soil to be protected all of the time.

Year	Number of Rains that Produced Runoff	Number of Rains that Produced 1/2 tons or more soil loss	Percent of soil Lost by Rains that Produced a half ton or More Per Storm				
			Continuous Cotton With Slope	3-Year Rotation on Contour			Strip Crop
				Cotton	Corn	Oats	
			Percent	Percent	Percent	Percent	Percent
1940	35	7	80	76	85	70	59
1941	32	6	58	67	68	72	87
1942	31	9	80	84	87	92	65
1943	22	6	94	99	87	93	83
1944	31	8	85	91	88	61	93
1945	38	21	82	95	84	79	75
1946	28	14	94	94	95	73	90
1947	16	8	78	80	74	60	88
1948	18	8	92	98	84	80	82

"The greatest amount of soil loss was confined to a few storms, and differed with the crop. The number of storms that produced soil loss varied from year to year, and the percentage that produced more than one-half ton of loss ranged from 20% to 50%. A study of the table shows this variation together with the percentage of soil loss for several practices by these few storms."

Monthly Distribution of Rainfall.- Thomas N. Jones, State College, Mississippi.-"The following table shows some interesting data on rainfall and temperature records at State College, Mississippi. High, low and average rainfall is given for each month of the year and the year in which the high and low rainfall was recorded is given. The past 39 year average maximum and minimum temperature for each month is given.

Sixty Years Weather Records, State College, Mississippi

	RAINFALL DATA				:: TEMPERATURE DATA		
	High	Year	Low	Year	Ave. 60 Yr. Period ::	39 Year Average Max.	Min.
January	12.90	1925	0.96	1943	4.88 ::	56.4	35.5
February	9.51	1939	1.57	1892	4.84 ::	59.8	37.4
March	15.34	1902	0.93	1910	6.20 ::	67.1	44.0
April	12.90	1912	0.45	1903	4.57 ::	75.8	52.0
May	10.29	1909	0.22	1941	4.05 ::	83.2	59.5
June	14.39	1900	0.58	1944	4.03 ::	90.6	67.4
July	16.00	1940	0.60	1901	4.83 ::	92.3	70.1
August	9.05	1926	0.70	1945	3.70 ::	92.4	70.1
September	8.87	1906	0.00	1897	2.71 ::	88.5	64.5
October	10.76	1918	0.00	1891	2.44 ::	76.6	51.7
November	11.20	1948	0.00	1924	3.57 ::	65.8	42.6
December	12.72	1897	0.77	1889	4.93 ::	54.4	37.0
60 Year Period	76.27		31.38		50.76 ::		

Runoff and Soil Loss in Relation to Rainfall in February 1949 - Thomas N. Jones, State College, Miss.-"The rainfall for month of February totaled 5.84 inches. The sixty year average for February is 4.84 inches. One inch excessive rain was recorded for the month. The total rainfall recorded for the year 1949 to date is 19.69 inches. This gives an excess of 9.97 inches recorded to date for 1949. Runoff and soil loss from bare plots during February 1949 are shown in the following table.

February	Rainfall	Percent Runoff	Pounds Soil Loss Per Acre
3	0.04)		
4	0.84) --	76	1,540
9	1.10)		
10	.38) --	92	1,240
14	.02)		
15	1.52) --	75.3	7,828
16	.40)		
18	.01)		
19	.80) --	60	536
24	.18)		
26	.14) --	No Loss	
27	.41)		
		Total	11,144 lbs.

Monthly Soil and Water Loss in Relation to Rainfall, and Rainfall Intensity - O. R. Neal, New Brunswick, New Jersey.-"In connection with the preparation of a report on the subject, rainfall intensities during the past 10-year period have been summarized. The data in Table 1 show the relationship of monthly soil and water losses to total rainfall and quantity of rainfall which exceeded an intensity of 2.00 inches per hour.

Table 1.--Ten-year average monthly soil and water losses from continuously cultivated plots without winter cover crops

	Total Precipitation	Amount Exceeding 2.00 in/hr. Intensity	Soil Loss	Water Loss
	Inches	Inches	Lbs./A	Inches
January	2.87	0	480	.40
February	2.56	0	110	.42
March	3.20	.01	290	.16
April	3.17	.01	470	.19
May	3.55	.43	420	.22
June	4.54	.80	1310	.54
July	5.77	1.70	1910	1.15
August	4.04	.60	870	.53
September	4.35	.61	680	.57
October	3.57	.36	720	.44
November	4.42	.15	620	.62
December	2.68	0	70	.10

"These runoff and soil loss figures are from plots which are cultivated during the growing season and are bare during the winter period. Vegetation, even as cultivated crops, is known to reduce runoff and erosion considerably as compared with uncropped areas. Notwithstanding this, the erosion losses have been far higher in the summer period than in the winter. It is evident that intensity of rainfall is relatively more important than is total amount in causing runoff and erosion. Differences in the seasonal losses would doubtless have been greater if the areas had been fallow throughout the entire year.

"The seasonal nature of runoff and soil losses is a matter of importance in the design of conservation practices. To be most effective the practices should be designed to provide maximum protection during the summer period when the erosion hazard is greatest."

PLEASE NOTE: There was an error in Mr. Donnelly's report for the Month of December 1948. On page 21, last paragraph, the word no has been omitted. It should read "There was no depression of grape yields, etc."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-Rain fell on 13 days totaling 2.61 inches. Intensities were low and surface runoff occurred on only the wheat watersheds. Runoff for these watersheds in the land-use comparison are given below:

FEBRUARY

Wheat watershed	Runoff total	Maximum rate of runoff
	Inches	Inches/hr.
Check (no manure)	0.24	0.030
Conservation (manure top dressing)	.10	.014

"Erosion and nitrogen loss in runoff from these two watersheds in January are given below:

JANUARY

Wheat watershed	Soil loss	Nitrogen loss
	Lbs. per acre	Lbs. per acre
Check (no manure)	3,956	0.50
Conservation (manure top dressing)	110	.11

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"Cold weather continued in February with a maximum average temperature of 28.6° and a minimum average temperature of 13.0° at the meteorological station. The mean average temperature of 20.8° was 6.7° below the long time normal. There were only 12 days during the month when temperatures were above freezing.

"Only 0.52 inch of precipitation was measured at the meteorological station during the month, which fell in the form of snow or sleet. Very little runoff occurred during the month, however, during the period February 22 to 27 considerable snow disappeared. It is believed that some of this moisture entered the ground, but no doubt evaporation accounted for a large percentage of the loss."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"During February the precipitation was significantly above 'normal' as was the case in December and January. The accumulated precipitation since the first of the year, exceeds 10 inches, the 'normal' accumulation around the middle of April.

"Approximately 2 inches of rain fell during a 12-hour period on February 14-15, producing probably the most general and greatest amounts of winter storm runoff measured from the experimental watersheds. The data are now being compiled and will be summarized in a subsequent report.

"Mr. Stoltenberg has spent considerable time on study of infiltration rates of watersheds in corn, under the prevailing and conservation treatments and has prepared the following summary of his observations, to date.

"Since the last report of this work in the November 1948 monthly report, Mr. T. V. Wilson has completed his master's thesis entitled, 'The Determination of Infiltration Rates from the Analysis of Rainfall and Runoff Records and the Correlation of Infiltration Rates with Soil Management.' The data used in this thesis were taken from the records on watersheds No. 14 and No. 15 for the years 1942 and 1945 which were successive corn years of a 3-year rotation. The method of determining infiltration was that developed by Horton, Sharpe and Holton, Holton, Schiff, and others. The individual infiltration curves for each storm were grouped into four curves, one for each watershed for each of the 2 years, using Horton's infiltration equation.

"Our suggestions and criticisms were, for the most part, limited to details and terminology with some help in applying the methods of analysis. The fundamental methods used in analysis and assembling of the data were selected by Wilson. We, therefore, find ourselves questioning most of the conclusions, due primarily to the methods used in analyzing the data. The methods used tend to cover up differences and apparent anomalies which we believe to be important. The effect of these methods on the assembled infiltration curves from which most of the conclusions were drawn is discussed below.

"On areas of the size of our watersheds (2-3.5 acres) and smaller, and where detailed studies of the mechanics of the infiltration process are being studied, the basic assumption that the infiltration capacity curve follows Horton's equation is unsound. Plot work at Auburn, Ala., and our results here, both indicate the equation is not complete; there are other important variables unaccounted for. One of these factors is the pressure deficiency of the soil water. When conditions are such that the upper portion of the soil with its high macro-pore space fills up, the pressure deficiency of the soil water approaches zero, and the infiltration rate decreases at a very high rate.

"This suggests two weaknesses in Mr. Wilson's treatment of the data. (1) When infiltration curves are averaged some attempt should be made to adjust them to the same moisture content for the upper portion of the soil. We have not attempted this but intend to do so. (2) Where there is evidence of 'filling up' of the soil or where the mechanics of the infiltration process are being examined Horton's equation should be used with caution, if at all.

"The method of determination of the infiltration curve for an individual storm as developed by the previously mentioned workers is essentially a method of allocation of the surface storage factors to arrive at a smooth curve. We have used what we call a method of sections. This method utilizes all available information from each section of the runoff rate curves that can be treated separately. Rates are utilized to a greater extent than methods using the cumulative curves. This sectional method is more laborious than the other but we believe results in a more accurate infiltration curve. In comparing our results with Mr. Wilson's the differences might be important enough to alter some of the conclusions.

"We have not completed the study of these hydrographs and we feel that the available data from other watersheds and for other years should be included before definite conclusions are reached. Our analysis of the same data used by Mr. Wilson has, however, resulted in some interesting observations and explanations.

"The reversals in the runoff behavior of paired watersheds was noted in the November 1948 report. Several reasons for this have been established for watersheds No. 14 and 15 and it is expected that the explanations will apply to other areas:

I. Explanation where a large portion of the runoff is at low rates: A check of runoffs of 1940, 1942, and 1945, indicates that in every case, runoff started on Wsd. No. 14 1 minute or more (generally 1 to 3 minutes) before runoff began on Watershed No. 15. This is indicative of a lower infiltration rate on Watershed No. 14 at the start of runoff. This lower infiltration rate on Wsd. No. 14 is confirmed by the consistently greater runoff from Wsd. No. 14 during periods when the runoff rate is low. Despite this, analyses of sections where the runoff rate is high (over 0.2 inch/hour) consistently shows a higher infiltration rate for Wsd. No. 14 when under contour cultivation.

The anomaly is best explained by a consideration of the soils and type of channel. Consideration of either of these factors leads to the same conclusion and at the present time their relative importance cannot be determined. Analyses on other watersheds should furnish a clue.

A. Channel effect:

Wsd. No. 14 has a better defined channel than Wsd. No. 15. This channel has been cut into subsoil and probably has a very low infiltration rate as compared with the channel of Wsd. No. 15. Also a certain quantity of water is concentrated over a smaller area on Wsd. No. 14 than on Wsd. No. 15. Therefore, it has less opportunity to infiltrate. Ground-water flow is a possible explanation for the more extended recession curves on Wsd. No. 14 but in light of the greater runoff during the first section of the runoff curves it appears that channel effect is more likely.

B. Soil permeability:

Wsd. No. 14 has about 20 percent of a relatively impermeable soil (Floyd silty clay loam) as compared with only 1 percent on Wsd. No. 15. Also this soil tends to follow the channel in both cases so any differences would not be obliterated by the runoff having to pass over other soils. This Floyd silty clay loam on Wsd. No. 14 lying as it does in a deeper, better defined channel would probably remain wetter for considerable periods after a rain. If one considers only the half acre or so surrounding the channel in both cases, it is easy to see why Wsd. No. 14 would furnish more runoff than Wsd. No. 15, as long as the rainfall rate did not exceed the infiltration rate in the upper portions of the watersheds.

II. Explanation where a large portion of the runoff is at high rates:

At times, when one of the paired watersheds is under contour cultivation and after a period of high total rainfall, the contour cultivated area by virtue of its higher infiltration finally 'fills up' the soil storage. The subsoil then becomes the 'bottleneck', resulting in a sharp drop in the infiltration rate on the contour cultivated area. This state of inversion will continue until a few hours have elapsed to allow for drainage thru the subsoil (this rate seems to be about 0.06-0.08 inch per hour) or until the other watershed 'fills up'."

"An examination of the runoff for the intervening period between 1942 and 1945 while both watersheds were in meadow and also the following meadow period indicates that the infiltration rates were very close to being the same on both watersheds No. 14 and No. 15. The effects of contour cultivation can thus be isolated.

"The usual explanation of the effect of contour cultivation on runoff is that it creates storage, holds the water on the land, and allows more time for it to soak in. Our results show that these conceptions are faulty.

"One of the reasons for misconceptions regarding the storage is due to concentration of the water in the furrows being very noticeable. If, for instance, conditions should be such that there was 0.10 inch depression storage and 0.30 inch surface detention on each of two areas, one contour furrowed and the other not, on the contoured area this water might be concentrated on one-fifth of the surface area and the average depth in the furrows would be 2.0 inch as compared with the average depth of 0.40 inch generally distributed over the area not contoured. This added depth and the continuity of storage in the furrows is very noticeable and impressive.

"Note also that this concentration effect on the contoured areas greatly increases the head causing runoff. We find that this effect on the head of water causing runoff has compensated for the effect of increasing the path and thus reducing the hydraulic gradient of the runoff. The relation between surface detention and runoff rate is therefore about the same on both areas.

"Theoretically at least, depression storage should be a constant depending on surface conditions with no relation to the runoff rate. Actually, due to variations in the infiltration rate over an area, the amount increases slightly until the entire area is contributing to the runoff and then remains constant unless severe erosion causes changes in the surface conditions.

"The following table has been established and due to the limiting conditions between the infiltration curve and the measured components of the hydrograph, these values can be checked. The use of the sectional method as compared to the other method requires that these values be fairly accurate.

Runoff rate Inches per hour	Depression storage - inches	
	Wsd. #14 Contour cultivated	Wsd. #15 Not contoured
0.05	0.04	0.02
.25	.09	.05
.50	.13	.07
1.00	.14	.08
2.00	.15	.09

"It should be noted that maximum differences are less than 0.10 inch, and, due to the higher runoff rates on the area not contoured the tendency was for depression storage to be about the same under both treatments.

"When the contoured area 'filled up' one might think that the storage effect of the contours would become important; however, due to the concentration effect and the similar surface detention-runoff rate relationship on the two areas, the effectiveness of the contours in storage would not be expected to change.

"We have found that the higher the runoff rate, the greater the difference in infiltration rates between the two watersheds. In other words, contour cultivation is more effective in the more severe storms.

"Assembling the above facts into a few words: Contour cultivation reduces runoff by creating conditions favorable to a high infiltration rate - not by increasing the storage. It does this by creating ridges which allows the water to infiltrate into the side of the contour ridges that have been protected from the sealing effects of rainfall impact, runoff, and compaction by farm implements. The higher the runoff rate the more effective the method becomes.

"An article by the writer, 'Runoff Losses from Permanent Pastures and Woodlots', appeared in the February issue of AGRICULTURAL ENGINEERING."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.- "Precipitation for the month of February, as measured by the USWB of non-recording rain gages, amounted to 2.38 inches at the cultivated watershed, 2.50 inches at the wooded watershed, and 2.21 inches at the stubble-mulch plots. These amounts are approximately 125 percent, 132 percent, and 116 percent of the 1.90-inch normal February rainfall for East Lansing. February precipitation at East Lansing can be expected to equal or exceed 2.38 inches once in 5 years, according to the frequency curves prepared from the 1864-1947 precipitation records. It rained three times, snowed three times, and sleeted six times during the month. The month was not steadily cold, and the combination of rain, snow-melt, and sleet-melt occasioned seven runoffs, as follows:

Watershed	Date	Amount of precipitation	Amount of runoff
A	2/8-9	0	0.0510
A	2/12	.82	1.4085
A	2/14-15	.80	.7631
A	2/18	0	.1654
A	2/22	.23	.1034
A	2/23	0	.0144
A	2/24	.15	.1220
B	2/2	.01	.1144
B	2/12-14	.82	1.5353
B	2/14-15	.80	.7944
B	2/18	0	.0300
B	2/21-22	.23	.0130
B	2/24	.15	.0323
B	2/24-25	0	.0944

"February 24th the Project Supervisor went to Milwaukee to confer with Messrs. Uhland and Musgrave, of the Washington Office, on the matter of the proposed study of a continuous record of soil moisture determinations in 15-minute increments. The study, in general, was approved, and request has been made that these men inspect the project at as early a date as possible and discuss the plan in more detail.

"Preparation of a guide for the proposed snow surveys of the Saginaw River Basin, in cooperation with the SCS-Operations Division, the U. S. Weather Bureau, and the Saginaw Valley Improvement Association continued. Request was made to the Division of Irrigation for the loan of six snow sampling kits for this season. It is anticipated that this study will be inaugurated at an early date."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"Crop yields for 1948 have been summarized as follows: For cotton, the yields from areas with conservation practices on the Government-operated land were 43 percent higher than from those areas with ordinary practices. For the tenant-operated land, the yield was 19 percent greater. The 3-year rotation, in which cotton follows winter peas, had the lowest yield of all treatments in 1948. The small growth of peas and late planting left this area in poor condition for a crop in the dry season of 1948. This treatment may give better results in more favorable years. The highest yield of cotton for the last 3 years has been with the 2-year rotation of Hubam clover and cotton. Corn yields on Government-operated areas with conservation practices were 25 percent greater than for areas without conservation practices. For the tenant-operated land, the increase was 31 percent, but all corn yields were lower on the tenant-operated lands. The yield of oats was determined more by the cold weather damage in March 1948, than by treatment. For several years the effect of Hubam clover in oats on the yield of oats has been to decrease the yield slightly.

"James B. Pope reports in connection with soil moisture that the recent rains increased the moisture supply on most areas down to 48 inches. On W-10 (ordinary farm practices) cultivated areas the percentages of moisture from samples taken the last week in February were as follows: 0-6 inches, 34.2 percent; 6-12 inches, 32.4 percent, 12-24 inches, 29.0 percent; 24-36 inches, 25.7 percent; 36-48 inches, 22.6 percent; and 48-60 inches, 22.2 percent. For the soils of this area 35 percent moisture is approximately the fall capacity and 20 percent the wilting point. It will be noted that, for depths below 36 inches, there is very little available soil moisture in areas with ordinary farm practices at this time.

"Fall-seeded oats and Hubam clover made good growth during the month and, with favorable weather, should furnish grazing for the cattle and sheep until the middle of March. The Dixie Wonder peas withstood the cold weather and made considerable growth during the month. They are to be turned under as a green manure, soil-improving crop prior to cotton planting."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville was 2.74 inches, as compared with the normal of 2.10 inches. Two inches of this amount fell on February 14 as sleet and rain. The runoff from this storm was about 1.50 inches, and the rate of the runoff at the peak, approximately 0.25 inch per hour, which agreed very closely to the maximum rainfall intensity.

"Precipitation at Fennimore was 0.67 inch, as compared with the normal of 1.00 inch. There was some runoff from melting snow, but due to ice conditions in the channel; accurate measurements of this were not possible."

Farm Ponds - T. W. Edminster, Blacksburg, Virginia.-At the request of Dr. John Lamb, Ithaca, New York, Mr. Holtan attended a conference at Ithaca to assist them in setting up a farm pond sealing project. Excerpts from a report of this meeting are given below:

"Pond studies as conducted at Blacksburg, Va., were outlined by Mr. Holtan and the remainder of the forenoon was given over to discussion of the material presented. This material closely followed the paper previously presented to the Virginia Academy of Science on 'Factors in Soil Compaction and Permeability'. Additional information on bentonite and soil defloculators was also given.

"During the discussion which followed, special interest was expressed in:

1. Field and laboratory technique and the logically improved applicability of lab-packed samples due to the fact that pond bottoms are also prepared.

2. Desirability of sand and higher moisture conditions in the soil for compaction. These had been considered prohibitive.

3. Bentonite was considered too costly for general consideration.

"The afternoon discussions were very interesting. Everyone present made contributions to discussion. Conditions and practices current in New York State were thoroughly discussed and some very pertinent points were brought up:

1. Hard pan soils are not clays but silts with some sand. They are very water tight.

2. Shale areas are encountered in New York with no soil whatsoever but in which ponds are needed.

3. Clays of New York are much less developed than are those of Virginia.

4. Organic matter may be a factor in soil compaction but it would undoubtedly be removed in skinning off of the vegetable material so need not be considered.

5. SCS in New York has long practiced the method of dragging soil up the wet side of the dam in pond construction instead of using end-to-end traffic on the fill. This causes a series of laminations through which the water would have to percolate.

6. Present earth dam construction is receiving only about 8 pounds per square inch compaction load (Crawler type tractor).

7. As a trial arrangement, one contractor in New York State is guaranteeing ponds constructed by him to hold water. No release as to name or location will be made until the end of the trial period. This is definitely a step in the right direction. It places the responsibility upon the man who will be present during the construction.

8. SCS Operations has a great need of a laboratory to which soil samples can be sent for testing as regards structural stability and sealing properties as well as optimum conditions and methods of handling.

"The study anticipated by Mr. Pistili as proposed during the afternoon sessions would constitute the establishment of laboratory equipment and procedure for testing samples of soil from prospective

pond sites as requested by SCS Operations. Mr. Pistili plans to assume the definition of optimum moisture for compaction as 'that condition not quite wet enough to exude moisture under desired compaction load'. Logically, this is the point of optimum lubrication and of minimum obstruction (by water) to compaction of the soil mass. He plans to prepare his samples at this moisture by saturation, partial compaction, and subsequent drainage over tension (presumably 60 cm.) prior to the final compaction. H. W. Davis and M. M. Weaver, Area Engineers, SCS, are to each choose three samples from prospective pond sites, and preferably covering a good range of soils, for Mr. Pistili to use in his study. These six samples will be studied primarily by compaction and possibly with bentonite to provide a basis for choosing the most economical and effective method of sealing. During this process the basis would be derived for establishing routine procedures for the anticipated field-service-laboratory."

In reporting on the pond sealing work for February, Mr. Holtan makes the following statements:

"In reporting, sedimentation curves were obtained on several of the soils after sealing with bentonite. All 11 soils were not completed, however, since they were not quite dry enough yet. Concerning these sedimentation curves, it is now felt that three possibilities would merit study:

1. Alter the time of shaking and the amount of water used in shaker bottle in a search for the effective particle or aggregate size.

2. Alter the fraction of soil considered by using various parts of the sedimentation curve. (What little information was gleaned from analysis indicated that the early part of the curve -- larger particle sizes -- is more effective than the colloidal end as regards percolation of the drainage samples of Mr. Turner).

3. Shape of particle is undoubtedly also a factor. Perhaps a method can be devised to determine whether the particles are primarily round or sharp and soils grouped accordingly."

Hydraulic Studies - F. M. Blaisdell, Minneapolis, Minn.- "Mr. Blaisdell and Mr. Donnelly spent January 31 through February 2 at the Whiting Naval Air Station, Milton, Florida, inspecting the drainage problems, becoming acquainted with the field studies and discussing the model studies with Messrs. Sutton, Schlaudt, Allaband, Moratz, and Lt. Commander Neumann. During this visit a large number of pictures were taken of the

present installations, the large gullies, and the deltas at the end of the ditch. The downstream end of one of these deltas could not be seen from the end of the badly eroded ditch. The delta was so long that it just disappeared in the distance. Many steel pile drop structures of the Morris-Johnson type had failed in this ditch. A contributing cause to their unsatisfactory performance appears to be that inadequate tailwater was not provided on the stilling basin. The importance of placing stilling basins low enough to insure adequate tailwater over the basin floor cannot be overstressed.

"A little work was done on planning a portable apparatus for demonstrating with flowing water the performance of various types of soil conservation structures. An understanding of how these structures perform is essential to their proper design and intelligent construction. Objections are frequently raised regarding the use of blocks in stilling basins and to needed refinements in the design of structures. These objections rapidly melt when the action of the various structures is thoroughly understood. This demonstration model will permit the many engineers engaged in soil conservation and flood control work in other parts of the country to see how the standard structure will perform under design flows."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Though rainfall is usually low during this period of the year, it will be noted from the following table that rainfall has been somewhat less than it has been for the past 2 years.

Location-Gage	Feb. 1949	Feb. 1948	Feb. 1947
Redland, Mowry	0.27	0.25	1.62
Sub-Tropical	.87	.24	1.95
Redland, Gossman	.32	.13	1.98
Plummer, Comfort	.68	--	--
Peters, Fla.	.14	.27	2.22
Princeton Grove	.31	.23	1.92
Cooper Grove	.20	.00	1.67
W. Mowry	.15	.24	1.66
E-33	.50	.40	1.21
Roberts, Avocado	.22	.56	1.92
Jeran Grove	.35	--	--

"As a result of the low rainfall we have had a loss in water table throughout the entire area. Losses in water table for the Redland profile ranged from 0.6 foot at Well No. 2, to 0.97 foot at the measuring point.

"On the Mowry Street profile losses ranged from 0.6 foot at Well E-32 to 0.86 foot at Well No. 26.

"Losses for the Eureka profile ranged from 0.62 foot at Well No. 17 to 0.89 foot at Well No. 13.

"Losses during this period were higher in the area bordering the Everglades. Though the loss has been relatively high, the average loss has not been as high as for last month.

"On February 28, 1949, the water table was 1.22 feet M.S.L.; February 28, 1948, 2.36 feet M.S.L.; February 28, 1947, 1.73 feet M.S.L.; and on February 28, 1946, 1.31 feet M.S.L.

"Readings have substantiated earlier findings that to maintain sufficient moisture to keep the soil moisture above the wilting point, the cycle during this period of low rainfall, low water table, must be shortened to 6-7-day applications.

"Readings for the period for the mulch plots show that there is little difference in the readings for the pine straw and shavings mulched areas, followed by grass, natural cover and check plot. During the past two periods the trend for the natural cover has changed, that is, during the early part of this test there was little difference between the last two, but recently the trend has been reversed. There is an accumulation of material on the surface which is giving a slight mulching effect.

"During this period of low rainfall there has been no loss of nitrates through leaching. It has been noted in one grove where ammonium sulphate was applied, that the reading the week following the peak release were somewhat lower. To date our data indicate that when fertilizers of which the nitrogen portion is composed of ammonia or urea the losses during the dry portion of the year are high. Some work will have to be done on this. It may be that this loss may be cut down by irrigation following the application. This substantiates work done several years ago where it was found that the loss of NH_3 was high when $(NH_4)_2SO_4$ was applied in the surface of a neutral to alkaline soil under rather high temperatures."

Drainage Studies - J. C. Stephens, West Palm Beach, Fla.-"The four month period from November 1 to March 1 has been the warmest and driest ever experienced in South Florida. Since November 1 the total rainfall at Miami was only 1.58 inches, or 7.69 below normal. The driest winter up to now was in 1928-29 when rainfall measured 2.63 inches. January also was windy with an average of 15.4, far above the old record of 12.5 set in 1945. As a consequence water tables have fallen rapidly from the high stages of last Autumn's hurricanes.

"Farmers in the Lake Worth Drainage District have been irrigating heavily for the past several months, and even peat lands in the upper 'Glades are finding irrigation necessary. Water levels in the lower 'Glades are now at, or below ground surface, and a much higher rate of lowering is expected for next month. With low-water conditions plus the heavy growth

of sawgrass that has developed during the past two years, extremely hazardous conditions with regard to 'Glades fires can be anticipated if rainfall is not imminent. It appears likely that emphasis will again switch from flood control to water conservation.

"A topographic survey and profiles were made along a strip of farmlands adjacent to the Hillsboro and North New River Canals from the Everglades Experiment Station to the upper locks on the North New River, a distance of approximately 10 miles. This survey shows the land to have subsided to an elevation only slightly above 12 feet M.S.L. between the old Everglades Drainage District Locks on both canals and the Hurricane Gate at Lake Okeechobee. It appears that operation of the Hurricane Gate by the U.S.E.D. for water control would be beneficial to farmers in the area, and results of the survey will be made available to the Drainage District for the purpose of conferring with the U.S.E.D. on this matter.

"A slope course was established on a drainage lateral in the Osborne grove. This ditch is approximately 5 feet deep with an average top width of 19 feet and bottom width of 10 feet. The lower 3-1/2 to 4 feet has been excavated by blasting the limestone and it is characteristic of drains required for farms in the Davie area. Both ends of the ditch will have pumps, and it is planned to obtain values for the coefficient 'n' under different water stages when installation of the south pumping plant is completed.

"Further analysis of data on the Osborne grove study shows that a part of the heavy seepage inflow into the 800-acre diked tract comes from the underground flow through the limestone which appears to obtain its 'head' from higher levels in the Conservation area pool above the North New River Canal. This seepage seems to underflow both the North New River Canal and the perimeter drainage ditch inside the dikes. The ground-water profile normal to the Conservation area dike indicate that the seepage from this pool is effective for a distance of about 1/4 mile beyond the dike. Thus, it would seem desirable to leave a 'buffer strip' of land adjacent to the proposed dikes contemplated by the U.S.E.D. Flood Control Plan in areas where similar geologic strata are encountered."

Drainage Studies - T. ... Edminster, Blacksburg, Virginia.- J. P. Walker reports, "Further study has been made on the diurnal fluctuation in the soil-water tables which was mentioned in the project annual report. Data collected from Gage II, Presson Farm, for the week of January 29 through February 5, 1949, was selected as a representative example of the diurnal fluctuation. By inspection, there seemed to be little difference between these data for Lenoir fine sandy loam and the Moyock fine sandy loam (Lee farm). For Bladen (or Bayboro) fine sandy loam (Norfolk City Farm) it is difficult to determine whether or not diurnal fluctuations occur at all times. Data collected from Gage III for December 20 through 27, 1948, gives excellent examples of water-table fluctuations between 9:00 a.m. and 5:00 p.m. for several days during the period.

"From observations of the above data, the characteristics of water table fluctuation seem to be as follows:

"When not influenced by rainfall to have a general average fall over a period of several days, fluctuations appear each morning and last until midafternoon. For each fluctuation there is a slight drop followed by a sharp rise and ending in a fall until it reaches the normal water-table curve. For example, from the above-named data of the Presson farm, fall started at 8:00 a.m., Wednesday, with the rise starting about 11:00 a.m. Recession started about 4:00 p.m. and reached the normal curve about 8:00 to 10:00 p.m.

"From inspection of temperature graph, it is seen that soil temperature falls about 8:00 a.m. and returns to the original temperature about 8:00 p.m. The time of the low point corresponds roughly with the time of the high point on the draw-down curve.

"At present little literature can be cited on this particular topic. Adolph Meyer in his 1928 revised edition of 'The Elements of Hydrology' refers to F. H. King in the 19th Annual Report of the U. S. Geological Survey (1897-98). Certain reports indicate that water table fluctuations may be due to barometric pressure. Two possibilities are cited as to how barometric pressure may effect soil water, -- (1) The atmospheric pressure is distributed over the entire water surface and the variations in pressure reflect fluctuation in water table. (2) That soil has varying permeability factors as to air and water movement which causes an ununiform or varying rate of air and water movement in the soil; i.e., varying heads of water."

Drainage Studies - R. B. Hickok, Walkerton, Indiana.-"Mr. P. I. Edwards completed an electrical sounding device for measuring the depth to ground water in the observation wells. This device promises to be easy to read accurately, and durable. We believe it will work satisfactorily in the 1-1/4" pipe wells."

IRRIGATION DIVISION

Water Conservation, Orange County - Dean C. Muckel, Pomona, Calif.-"It was learned during the month that Orange County water interests are well along in the development of a program to salvage water now being consumed by non-economic growths in the Santa Ana River Canyon below Prado Dam. By relocating a diversion structure, construction of a siphon and enlargement of an existing canal, it is hoped to salvage approximately 1,500 acre-feet of water per year. While the physical aspects of the problem are not particularly difficult to overcome, although expensive, the legal problems involved are complicated and time-consuming. This work is being done on the basis of the report, 'Water Losses in the Santa Ana River Canyon below Prado Dam, California,' by Muckel and Blaney in June 1946. This project including the one now under way by Orange County water interests to salvage approximately 8,000 acre-feet of water now being consumed by non-economic growths in Prado Reservoir are the most extensive efforts known at this time to salvage water being wasted by non-economic plants. The Orange County Ground Water Basin has an overdraft of 12,000 acre-feet annually. The salvage of waste water is intended to at least partly alternate this overdraft."

Evaporation Losses - Harry F. Blaney, Los Angeles, Calif.-"Observations at stations established several years ago for determining evaporation losses from storage reservoirs and lakes at high elevations, ranging from 5,380 feet to 10,000 feet, were continued by the cooperator during 1948. Monthly evaporation losses have been compiled and are shown in the following tabulations:

Month	Evaporation in inches							
	Shaver Lake (Elev.5,380 ft.)		Huntington Lake (Elev.6,960 ft.)		Florence Lake (Elev.7,330 ft.)		Kaiser Pass (Elev.10,000 ft.)	
	W.B.P.	Y.S.P.	W.B.P.	Y.S.P.	W.B.P.	Y.S.P.	W.B.P.	Y.S.P.
1948								
June	6.64	4.95	F.	F.	6.69	4.59	F.	F.
July	8.63	6.95	8.56	6.62	9.66	7.37	8.25	6.34
August	7.95	6.67	7.82	6.43	8.92	7.29	7.71	5.98
Sept.	6.29	5.52	6.27	4.81	6.67	5.41	6.15	5.04
Oct.	3.38	2.88	3.23	2.26	3.47	2.64	F.	F.

W.B.P. = Standard Weather Bureau pan (diameter 48 inches, depth 10 inches).
Y.S.P. = Young screen pan (diameter 24 inches, depth 36 inches) = approximate lake evaporation.
F. = Water frozen part of time. Partial record only."

San Fernando Valley - William W. Donnan, Los Angeles, Calif.-"Water table observations on a series of 60 piezometer wells in the western half of San Fernando Valley have been made for a period of 48 months. During this period the climate of the valley has ranged from a relatively wet period to

an extremely dry period. Thus, these data provide an excellent index of the effect of rainfall and other climatic changes on the water table problem. Two water table contour maps have been drawn for the two extreme ranges of water table elevation. One map was drawn from water table observations made on January 7, 1947 subsequent to a period of heavy rainfall. The second map was drawn from water table observations made on October 5, 1948 after 22 months of extremely dry weather. The water table elevations in the artesian well area show relatively little change on the two maps. The conclusions are that the leakage from the artesian wells and not rainfall is the significant factor in the high water table problem of San Fernando Valley."

G. Marvin Litz, Los Angeles, Calif.-"Two maps were completed from the data assembled by the land use survey of the San Fernando Valley Soil Conservation District. One is a general map of the District showing the principal streets and water courses and the extent and location of crop land irrigated in 1948. The irrigated portions of the district were outlined and cross-hatched to more clearly distinguish them. A second more detailed map shows the southwest portion of the district where the high water table problem occurs. The breakdown is into 16 classifications, including irrigated and dry farmed crops and residential and industrial areas. This map is to be used to estimate the influence of the immediate land use on the high water table problem. A comparison of these two maps with land use maps made of this area in 1938 indicate a considerable increase in residential area during the past 10 years."

Imperial Valley - George B. Bradshaw, Imperial, Calif.-"Reconnaissance work was started this fall on the west Mesa of Imperial Valley. This area consists of about 125,000 acres lying directly west of the presently irrigated area of the District. The land is potentially irrigable from the west end of the All-American Canal. The purpose of this reconnaissance is to locate all wells and start a series of water table records. Some 25 wells and springs have been located in the West Mesa and adjacent areas. Samples of water have been analyzed by the District and a water table contour map is being prepared. A long range recorder which will run for three months has been placed on one of the centrally located wells. In order to supplement the present data on rainfall, a standard Weather Bureau rain gage has been installed at the United States Gypsum Company mine at the west edge of the West Mesa. It is anticipated that the data from existing wells and the data on rainfall will continue to be compiled by the cooperating agencies for a number of years."

Spreading Water for Storage Underground - A. T. Mitchelson, D. C. Muckel, Hayden K. Rouse, Eldred Bliss, Curtis Johnson.-Programs of operation were prepared for the Minter Field and Wasco test ponds and submitted to G. H. Stockbridge, Engineer, North Kern Water Storage District, for his approval. Because there was a probability of converting from well water to canal water for supply at the Minter Field ponds, two programs were prepared for

this group: (1) To apply if canal water does not become available and it is necessary to continue use of the well, and (2) to apply in case canal water becomes available. Since there is considerable difference in the hardness of the well and canal water, the source of supply must be taken into account in setting up programs of operation and development of experimental work. All tests outlined for both groups of ponds were made to conform with the requirements of the laboratory work.

On a trip to Bakersfield on February 7-10 (including other areas of the upper San Joaquin Valley), the technicians of the soils-microbiological laboratory were interviewed regarding the requirements of the field and laboratory studies with particular reference to procurement of equipment, supplies and materials. The project leader and the project supervisor completed details of the working program for the personnel of the research studies and discussed them with the individual workers. The outline has since been released to the committee of cooperators with an invitation to meet and discuss the program. The cooperating officers of the North Kern Water Storage District were invited to inspect the laboratory and equipment, and Messrs. Rouse, Bliss and Johnson carried out some soil and microbiological tests to demonstrate the practical research work we are carrying on, illustrating reactions of soil-water vegetable combinations in test ponds.

A field inspection was made of proposed Visalia experimental spreading areas, and local officers of the Bureau of Reclamation were interviewed regarding progress the Water Conservation District is making in preparation of the two 5-acre experimental plots. Our field examination showed no signs of activity, and we found that they were planning on leveling but not adding cotton-gin waste this year. They felt that with prospects of short supply or no water, the addition of the waste would not be necessary. We have records showing that the mixture of soil and waste do not act advantageously until the two have been in combination for several months. We are still trying (diplomatically) to convince the officers of the District that the mixture of soil and waste material several months before water is applied greatly increases percolation rates.

Sampling of the pond water at Wasco and Minter Field was continued and fairly satisfactory technique for taking and running the samples was developed and is now in use. Samples of all ponds and supply are taken once a week and run as soon as they can be brought to the laboratory. Experiments are being continued on taking samples at several places in some ponds in an effort to determine what differences exist and what sifnificance they may have.

Several days were spent in the field drilling test holes to find the best location for the new concentric ponds. Mechanical analysis of several samples were run in the laboratory in connection with this study. A surprising degree of non-uniformity occurs in the vicinity of the Wasco ponds. Several more test holes are planned for the near future.

Samples for permeability studies were taken in Pond 1A and 2A at Minter Field and in Pond 12 and 17 at Wasco with the Pomona samples. Distributed samples were also taken from the same location for other studies.

Preliminary studies were started on the ability of a water extract of cotton gin waste to stabilize soil structure using the water drop method of T. M. McCalla.

The buffer pond experiment was continued through February with both inner and outer ponds flooded to a depth of approximately 6". Rates of percolation declined during the month as a whole, but the phenomenon noticed during January in the inner pond continued in February. The rate held substantially firm during the first week then dropped during the next week, held firm during the third week, and resumed its decline toward the end of the month.

R-3-3-1 - Snow Surveys and Irrigation Water Supply Forecasts - Homer J. Stockwell.-Snow survey reports for the Colorado, Missouri-Arkansas and Rio Grande drainage basins, based on February 1 surveys, were published on February 10. Unusually heavy snow cover was reported for these drainages and the excess over the normal was greatest on the headwaters of the Rio Grande and San Juan in Southern Colorado.

Numerous inquiries were received as to potential flood hazard from the excessive snow cover. However, it is not believed that the possibilities of floods from mountain snow can be accurately forecast at this early date. Press releases of the snow cover situation were prepared for Colorado A & M College, Wyoming Experiment Station and New Mexico A & M College. A photographer from Life Magazine accompanied me and a Forest Service Ranger on a snow survey trip to Leadville to take pictures for an illustrated story entitled "Water in the West." The trip to the course was made in a snowmobile used by the local power company in patrolling their mountain power lines.

The last week of February was spent making snow surveys on the Rio Grande in Colorado with the new "Sno-Cat" purchased by the Bureau of Reclamation. This machine did not operate satisfactorily in granular snow with a light crust, but under other conditions it was very effective in reaching the snow courses.

From limited snow cover reports for March 1, it appears that normal accumulation of snow accrued during February.

R-3-2-1.#2 - Performance Tests of Well Screens - Carl Rohwer.-Work on the Well Screen Project during February consisted of loss of head studies on four wire mesh screens, one louvre-type screen and one punched screen. All the screens were 24 inches long and 12 inches in diameter. The

laboratory work was performed by Mr. Gilbert Corey. He is at present changing the equipment in preparation for tests on gravel envelopes.

Snow Surveys and Water Supply Forecasting - W. D. Criddle, Boise, Idaho.- During the month of February nine snow courses on the Payette and Wood River Watersheds were surveyed out of the Boise office. On the 9th of February the Snow Survey and Water Supply Forecast report of 18 pages was released to some 450 subscribers scattered throughout the United States. The following summary statement was included in this report:

> "Surveys made on February first throughout Columbia Basin show a snow pack of greater than normal depth for the entire basin. This excess varies from about 10 per cent above normal in the Upper Columbia and Kootenai drainages of Canada to nearly 250% of normal in the Willamette Basin of Oregon. Snow cover on the headwaters of the Yakima River is nearly twice normal."

Because of the unusual amount of snow on some of the watersheds, plans for special surveys were developed. It is anticipated that on key courses surveys will be made on April 15, May 1, May 15 and possibly June 1, dependent upon how critical the snow cover situation is as the season progresses. An office study of runoff, snow cover, valley precipitation, temperatures, etc. is being made to determine the probability of floods of damaging proportion on the more critical watersheds.

Sprinkler Irrigation Studies.-The work outlined covering study on sprinkler irrigation has now been approved by the Idaho Agricultural Experiment Station and the U. S. Bureau of Reclamation and has been sent to Mr. Clyde, Chief of the Division of Irrigation for his approval and transmission to Washington, D. C.

Consumptive Use Studies in Utah.-A final 72 page progress report containing 52 tables was prepared on consumptive use of water requirement studies in the Colorado River portion of Utah during 1948. This report was reviewed on February 24 before representatives of the Utah State Engineer's Office, Utah Agricultural Experiment Station, U. S. Geological Survey, U. S. Bureau of Reclamation and the Division of Irrigation, Soil Conservation Service in Salt Lake City, Utah. A number of questions were raised regarding the results of the 1948 investigations, particularly as regards the contribution to consumptive use by precipitation falling during the growing period. Special studies are planned to determine the effect of precipitation on consumptive use during the 1949 growing season. Plans for next years study were presented to the group and were approved.

Clyde E. Houston reports.- February snow surveys throughout Arizona indicate a potential flood hazard on practically all mountain streams. Heavy snow storms combined with sub-normal temperatures have produced record breaking snow packs. Although reservoir storage is much improved, the

past drouth was so severe that continued abnormally heavy snowfall is necessary to overcome the water shortage which has been accumulating during the past six years.

February snow surveys at key courses in Nevada show a greater than average snow pack throughout the State. In general, precipitation has been below normal. Greatly subnormal temperatures during the winter have retained much of the winter precipitation on the ground in the form of snow.

In general, the ground under the snow pack is not frozen and due to an extensive drouth last fall there is very little moisture in soil under snow. A potential flood hazard exists on main local drainages. It is felt that only by heavy rains can the low snow be carried off as floods. Snow stored water on the eastern slopes of the Sierra is almost normal. Reservoir storage throughout the State is quite low.

Dean W. Bloodgood, Austin, Texas.-The silt conditions of Texas streams have changed considerably during the month from what they have been during the past year or so. The drouth has been broken by good rains over most of Texas, and many of the streams are carrying considerable silt load at the present time.

During the month some progress was made in computing the silt load for eight stations (of a total of 24 stations). The data are to be used in our regular annual progress report for the water year ending September 30, 1948.

A conference was held on the 24th between Messrs. Burdge Irelan and James Raby, Quality of Water Division, USGS, Austin, and myself regarding a silt study they are planning to make for the Bureau of Reclamation at Robert Lee station on the Colorado River and about 35 miles north of San Angelo. The study will consist of making comparison tests between U. S. DH-48 and our Department of Agriculture (Texas) samplers. For the past several months the USGS have been making silt determinations with the U.S. DH-48 sampler for the Bureau of Reclamation. The Bureau is contributing $2,500 a year for silt determinations at this station. We have about $7,000 for 24 stations. We loaned one of our samplers for the test. The tests will be conducted by Mr. Raby of the USGS.

Don R. Mitchell, Logan, Utah reports.-The first several days of the month were spent in the shop, working on the Snow machine in order to get it ready to make a Statewide Snow Survey as requested by the State Engineer for the purpose of being informed as to the extent of the potential flood hazards existing throughout the state.

I left during the day of February 9 to begin a Statewide snow survey. I spent the remainder of the month traveling to the various watersheds of the State to determine the depth of snow cover and water content. On this trip I travelled about 1,600 miles with the truck and approximately 500 miles with the snowmobile.

I made snow surveys on Cedar Mountain, Beaver River, Payson Creek, Hobble Creek, Brush Creek, Ogden River, Provo River, Logan River and Bear River.

The snowmobile operated very satisfactorily during the entire trip. The only difficulty encountered was a leak in the radiator caused by overheating in the trip to the head of the Provo River.

The snow was very soft and fluffy during the first few days of the trip.

Seven press releases were made during the month, concerning the extent of the snow cover and water content.

A report was prepared and submitted to the State Engineer's Office relative to the snow cover and water content as found on the high watersheds during the Statewide snow survey.